Physics 11 Name:

**Energy Unit Review** Date:

**Energy Unit Test will cover the following:**

* **Work**
* **Mechanical energy (potential energy and kinetic energy)**
* **Thermal energy**
* **Law of conservation of energy Use: g = 9.81 N/kg**
* **Power**
* **Efficiency**

1. Potential energy is the energy an object has due to its .
2. How much potential energy is gains by a 20kg bag of sugar lifted from the floor to a shelf 2.0m high?

***[3.9 x 102J]***

1. A ball with a mass of 25 kg is suspended by a string from the ceiling. In this position it possesses 100J of Potential Energy with respect to the floor. If the string is cut , what velocity will the ball strike the floor at? ***[2.8 m/s]***
2. A 20 g bullet is shot vertically upward with 3.6 x 105 J of Kinetic Energy. What maximum height will it reach? ***[1.8 x 106 m]***
3. A car of mass 1250 kg travels down a hill 45 m high. If the total kinetic energy at the bottom of the hill was 1.5 x 105 J, how much energy was lost due to friction/heat? ***[4.0 x 105 J]***
4. How much work is done by a 70 kg worker exerting a force of 1000 N against an immovable wall? ***[0 J]***
5. If 125 J of work are used to push a 12 kg box along a table using 65 N of force, how far will the box travel? ***[1.9m]***
6. An athlete is able to raise his body a distance of 2.1 m in a time span of 1.50 s. What average power does he develop? (his body mass is 60 kg) ***[8.2 x 102 W]***
7. A 35 kg ball is raised to a height of 15 m and is then dropped. What is its total energy when it is half-way back to the ground? ***[5.2 x 103 J]***
8. A 30 N force moves a mass through a distance of 10 m in 20 s. What is the power? [15 W]
9. Which of the following requires the most power?
   1. climbing 2 flights of stairs in 6 s.
   2. climbing 1 flight of stairs in 4 s.
   3. running down 3 flights of stairs in 14 s.
   4. climbing 3 flights of stairs in 12 s. ***[a]***
10. An engine does 1.2 x 104 J of work in 60 minutes. What is the engine’s power? ***[3.3 W]***
11. A mass of 30 kg is lifted at a steady speed from the ground to a platform 1.5 m above the ground. Calculate the work done on the mass. ***[4.4 x 102 J]***
12. A person did 5,400 J of work in pushing a car a distance of 60 m. What average force did the person exert? ***[90 N]***
13. What is the gravitational potential energy of a 20.0 kg box if it is lifted 950 cm respective to the ground? ***[1.86 x 103 J]***
14. What is the kinetic energy of a 700g ball rolling down a hill at 24.0 m/s? ***[202 J]***
15. A heavy box slides down a frictionless incline as shown in the diagram. If the box starts from rest at the top of the incline, what is the speed at the bottom? ***[17.2 m/s]***



1. King Kong is running at a speed of 15.0 m/s and grabs a hanging vine. How high can King Kong swing? ***[11.5m]***
2. A 200kg box is pulled 14.0 m along a level surface by a rope. If the rope makes an angle with the surface of 30.0°, and the force exerted through the rope is 175 N, how much work is done on the box? ***[2.12 x 103J]***
3. An insulated container contains 540g of water at 35.0°C. If 400g of copper (c=390 J/kg•°C) at temperature 115°C is added, what is the final temperature when the mixture it is completely mixed? ***[40.1°C]***

Hint: ΔEhw + ΔEhc = 0

1. A 200 W electric motor is used to lift a 63.0 kg mass to a height of 7.00 m in 24.0 s. What is the efficiency of the motor? ***[90.1%]***
2. You exert a force of 250 N in pulling 16.0 m of rope using a pulley system to lift a 635 N object 4.50 m. What is the efficiency of the pulley system? ***[71.4%]***
3. State the Law of Conservation of Energy. Back up your explanation mathematically.
4. What force is needed to push a 55.0 kg box up the incline described in the diagram below if the efficiency of the machine (ramp) is 75.7%? ***[356 N]***

3.5m

7.0m